(E) POST-OPERATIVE.

(i) Sitting posture with macintosh bib.

(ii) Hourly irrigation of mouth fracture-lines, and drainage tubes with warm 4 per cent. soda bicarb.

(iii) Frequent feeds by intra-oral or intra-nasal tube (fluid intake kept up to six pints in twenty-four hours).

(iv) Lubrication of soft tissues, lips, etc., with liquid paraffin or acriflavine in glycerine, 1/1000.

(v) Preparedness for secondary hæmorrhage from second to twelfth day.

(vi) Co-operation with physician to avoid chest complications.

(F) REMOTE TREATMENT.

(I) *Bone Grafting.*—At least *six months* should have elapsed from disappearance of sepsis. As a general rule, gaps of over 1-5 cm. will require grafting. The ideal graft obtained from iliac crest. Graft after bending and shaping should be fixed with stainless steel ligature. Fixation should be firm enough in four weeks for movement to be allowed.

(II) *Plastic Repair.*—To be undertaken by specialist plastic surgeons. Except for :

(i) Buccal epithelial inlay, which enables a sulcus to be made between the cheek and the bone-graft, and so enable a denture to be applied over this area.

(ii) Excision of scars where the final cosmetic result is not in doubt.

(iii) Thiersch grafting for the less extensive granulating wound.

TREATMENT OF COMPOUND FRACTURES WITH SPECIAL REFERENCES TO COMPOUND FRACTURE OF LOWER LIMB

I. GENERAL FIRST-AID MEASURES.

(1) Treatment of hæmorrhage a primary consideration. Avoid unnecessary tourniquet.

(2) General shock measures.

(3) Alleviation of shock by protection from further risk of exposure, loss of heat, hunger, fatigue, and fear.

(4) Relief of pain : (a) morphia; (b) immobilisation.

(5) A.T.S.

(6) A gas gangrene serum.

No manipulation or attempted reduction. Pain is controlled by adequate immobilisation. The Thomas splint should be used for fracture of femur, knee-joint, tibia, and fibula, and equally important for extensive wounds of the soft parts.

Clothing should not be removed, and it is not often necessary to take off the boot. The whole limb must be elevated either on suspension bar or by other means.

The wound.—Sprinkle with iodine. Cover with pad and bandage or shell dressing. During *transport,* bandages, slings, and traction device should be frequently

inspected, also watch kept for hæmorrhage. *Record* of morphia and/or other medication given.

II. Surgical Treatment.

No operation should be undertaken except where full surgical facilities are at hand. General measures are only discussed, as each case presents its own problems, and the surgical approach must be a matter of individual experience and judgment. The main points at issue :—

1. When to operate.
2. When to excise.
3. When to do a rapid debridement.
4. When to amputate.

(1) Under civil conditions, about eight hours may be regarded as the limit allowed, when after surgical toilet, an open fracture may be converted into a closed one. This may be regarded as the period of contamination, during which excision may safely be practised. Under war conditions, excision may be practised up to twelve hours, but it is well known that after six hours the hæmolytic streptococcus may have gained entry into the tissues.

(2) *The operation.* Preparation of skin. No tourniquet is employed. The wound is covered with gauze soaked in H^2O^2. Surrounding skin washed, shaved, and washed again, always in a direction away from the wound. The skin is then painted with iodine. Remove dressing. Excise skin and subcutaneous tissue, if possible in a single piece. Then invert sterile towels over skin-edges, and secure. Dealing with compound fractures of femur and tibia, it is an advantage to provide some form of skeletal traction during the operation.

Deep tissues are searched for foreign bodies. Damaged non-contractile muscle is removed. Fascial planes are incised to lay open all the recesses of the wound, and to prevent future pocketing. It should be remembered that the velocity of the H.E. particle is such, that resistance by bone converts it for practical purposes into an explosive agent, and the injury to soft parts may be out of all proportion to the size of the particle or size of the entry-wound.

Completely detached bone-fragments are removed, and those retaining attachment to soft parts are preserved. Contaminated bone-edges are trimmed with a thin osteotome. Every effort is made to render the wound dry, and only larger vessels require ligature. It is our practice to flood the area with H^2O^2, which is reasonable in the face of possible infection by gas-forming organisms. Hydrogen peroxide also will often bring to light small foreign particles and separated tissue.

No attempt is made to suture muscle nor aponeurotic layers.

As a rule, only the skin is closed by silkworm gut, and there must be no tension. Many extensive wounds are unsuitable for closure. Closure of the wound makes the fracture a closed one, and the surgeon proceeds to further manipulation if required, and to immobilisation of the limb. The local application of sulphonanilamide is desirable, and may be distributed throughout the wound with an insufflator, or in handy fashion with a spoon.

Immobilisation may be secured with skeletal traction, and the Thomas or

Brauns splint. If plaster of paris is employed, the case is more readily portable.

PLASTER OF PARIS.

(1) Should be applied directly to skin, but bony prominences, such as the crest of the ilium, tibial crest, and malleoli, may be protected with adhesive felt.

(2) The wound, whether closed or open, together with a generous area of surrounding skin, should be covered with vaseline gauze. This will prevent the troublesome dermatitis which often follows when the skin is exposed for long periods to discharge.

(3) Plastering by slabs is preferable.

(4) On no account should anyone except the responsible surgeon be allowed to nibble the plaster, for swelling always follows the plaster-edge. Should the plaster require alteration, it should be split throughout its whole axis. In this respect it is an advantage to score the plaster with a knife before it is dry, to provide an easy line of cleavage.

(5) Windows over wounds are not desirable, and merely cause bulging of the tissues and congestion.

(6) An evenly-applied plaster will provide an even distribution of pressure.

(7) The limb should be elevated.

OBSERVATION OF PLASTER CASE.

1. *Circulation.*—Circulation in the toes frequently observed. Test each digit by pressure, when the blood-return should be rapid. Do not confuse bruising with ischæmia. If the circulation is embarrassed, split plaster throughout the whole length.

2. *Pressure sores.*—Due to pressure over bony prominences. Inequality of pressure. A frequent cause is due to allowing an edge of the plaster bandage to cut across the case and produce a ridge on the inner surface.

Roll bandage on, and do not pull.

3. Finger and thumb depressions of assistant.

4. *Cracking* at joint level.

5. *Depression* by allowing cast to dry on hard surface.

6. Some *œdema* is inevitable in the digits, but elevation and active exercises of toes is usually sufficient to control. Cast should always extend to the web of toes (dorsum) and beyond toes (sole).

7. *Temperature.*—Nearly always an initial rise.

8. *Dermatitis.*—Characteristic burning pain and irritation.

9. *Blistering* of skin hardly ever occurs in supported limb.

10. Progress of *inflammation*—characterised by the usual signs and symptoms.

11. General complications :—Hypostatic pneumonia.
Mental impairment and degeneration.

12. *Odour.*—The unpleasant odour from a compound fracture may be mitigated by the use of filter cloth.

13. *Sharp edges* should be trimmed and bound with adhesive tape.

14. *Bed exercise* should be graduated and begun at once. Cases confined to bed should be nursed outside if possible.

15. Bed cases to become *ambulatory* at the earliest opportunity.

16. In our experience, *segregation* of bone cases is desirable in all cases.

17. Allow no one to NIBBLE the plaster.

The Treatment of Late Cases.

No excision should be attempted after eighteen hours, although there can be no inflexible rules. These cases fall into two classes :—

(a) Those with evidence of toxic absorption.

(b) Those exhibiting no such signs.

The treatment of both is *debridement*. This implies the removal of dead and foreign matter with a wide opening up of fascial and aponeurotic planes, to provide easy and unhampered drainage. Use of sulphanilamide is desirable. The wound is lightly packed with vaseline gauze, and the surrounding skin is similarly protected. The whole limb is encased in plaster, after the lines of the Winnett Orr treatment. This procedure may be accompanied by an initial rise of temperature. Successful treatment results in :—

(i) Relief of pain.

(ii) Rapid improvement of general condition.

Indications for Removal.

1. Laxity of cast.
2. Secondary hæmorrhage.
3. When condition of patient fails to improve, or deteriorates.
4. When plaster becomes softened by discharge.
5. When smell becomes intolerable.

Indications for Amputation.

Lower Limb.	Upper Limb.
Injury to femoral or popliteal is very serious.	Arterial injury relatively less serious.
Loss of skin and disruption of main neurovascular supply.	Do.
As a life-saving measure to control hæmorrhage.	Rarely necessary.
Other Considerations.	
Artificial limbs excellent.	Almost useless.

Contamination.—Lower half of body is always more soiled than the upper.

Gas gangrene.—Fairly common in leg. Rare in arm.

Shortening of importance in legs; not so much in the arm.

An additional military factor.—A long evacuation phase, and absence of skilled surgeons may be in favour of primary amputation.

Methods of Applying Traction to the Lower Limb.

In most cases it is an advantage to provide means of skeletal traction before attacking the fracture-site.

Femur.

1. Thomas splint. Kirschner wire extension via tibial crest.
2. Brauns splint and skeletal traction.
3. Sliding-bed traction.

Tibia and fibula.

1. Watson Jones apparatus.
2. Thomas splint and flexion-piece, with Kirschner wire extension via os calcis.
3. Brauns splint and skeletal traction.
4. Distraction apparatus.

Two Final Words.

1. The treatment of all fractures is only just begun when reduction is secured and infection is controlled, and only ends when rehabilitation is complete.

2. The commonest single cause of non-union of any fracture is incomplete immobilisation and failure to immobilise for sufficiently long.

THE TREATMENT OF BURNS AND SCALDS (EXCLUDING CHEMICAL BURNS)

In view of the varieties of treatment, simple and elaborate, which have from time to time been advocated for the treatment of burns, and also the considerable controversy which is, at the present time, centering on this practical subject, members of R.A.M.C. hospitals and consultant members of civil hospitals in the Belfast area have met and considered what measures might be taken to unify and standardise the treatment of burns.

As a result of these meetings, the following lines of treatment are recommended :

First-Aid for Cases of Burns and Scalds Requiring Hospital Treatment.

Give Warmth.
Fluids (hot sweet tea).
Morphia in adequate doses, e.g., one-eighth to one-half grain for adults, noting times and dosage on label.

Avoid Undue exposure.
Clothing should only be removed by or under orders from the medical officer, and only when delay in transport to hospital is likely (this does not apply to clean burns or scalds).

Apply Clean dry lint to exposed areas of the burn. Greasy dressings should not be applied, as they make subsequent cleansing and treatment difficult.